

## Chapter 10 O&M Equipment Needed

### 10-1 Overview

There is a variety of equipment available for initial delivery of maintenance chemicals, developing wells, and handling well pumps. These are generally described in ADITC (1997), Borch et al. (1993), NGWA (1998), Alford and Cullimore (1999), and other publications with a focus on field equipment and techniques appropriate to well PM. The following recommendation is not intended to be all-inclusive, but illustrative. Such systems should not be assembled or operated without training by personnel experienced in these practices.

### 10-2 Example Basic Well Maintenance Field System

*a. Chemical mixing.* A tank trailer should be equipped with

- 500-gal (1.9 cu m) chemical mixing tank for chemicals (acid duty, see EM 1110-1-4008).
- A second set of tanks to contain purge water for transfer to treatment. These tanks often need to be augmented by additional portable tanks.
- Transfer pumps (in line to mix and feed to the well) and hoses with fittings to match those at treated wellheads.
- Provision to house personal protective gear and additional safety gear such as ventilator blowers and harnesses, MSDS, and material and instruction for neutralization and first aid, spare parts, and basic chemical mix recipes. Also included should be a convenient means to call for assistance such as a wireless telephone or site-frequency radio.

*b. Equipment handling.* A means of hoisting and handling chemical drums, pumps, and associated pipe systems is needed. Commonly this is a conventional water well pump hoist with a maneuverable boom, of sufficient size to hoist any object to be lifted in the well field (not < 5-ton (4535 k) hoisting capacity).

(1) Some hoists are equipped with reciprocating beams to permit surging. These are suitable for light surging redevelopment that is not of long duration.

(2) Alternatives include small, motorized, reversible pump puller units that apply force to pipe via rubber tires or tracks. The motion is reversible, suitable for surging, and also permits rapid pump pulling for service and inspection. This will save much time and effort. Rigid well pipe would be specified for this application.

(3) Flexible well discharge pipe is coiled in the same manner as fire hose. A wheel device to run the hose smoothly from the vertical to the horizontal orientation is needed. These are routinely supplied by the hose supplier.

*c. A development and test pumping trailer.* This trailer should house:

- Development tools such as surge blocks or jets, brushes, or equipment for recirculation cleaning.
- Spare pipe and hose.

- Orifice weirs or flow meters.
- Water-level probes and other instrumentation and spare components such as bolts, weir plates, and blocking.

*d. Ancillary gear.* Additional parts and equipment needed on hand include:

- Spare parts, pipe and hose, and pumps, which should be standardized to the extent possible.
- Air compressors, generators, etc.
- Hand tools.
- Biofouling (BART etc.) tests and portable water quality and power testing instruments for maintenance monitoring.
- Voltage, amperage, resistance meter

These can be housed separately or on one of the field trailers or vehicles.

### 10-3 Provision of Maintenance Equipment

*a. Large and remote projects.* Sizable and more remote sites should have equipment dedicated to the project as described in Section 10-2 and trained personnel on staff to perform maintenance. The criterion for this threshold is when a separate well service company would devote more than three-staff months on site per year to perform services.

*b. Additional equipment and service provision options.* Systems that can be serviced by qualified commercial well service providers should do so. These companies are typically in a better position to maintain and provide a wider range of equipment more cost-effectively than site project management. However, particular projects, sites, and O&M contractors may have specific skills, preferences, or needs that would result in a combination of approaches. Options include:

(1) Dedicate equipment to the site and maintain a well maintenance crew where the level of effort for well maintenance is six staff-months per year (crew of two, dedicating three work months each).

(2) Dedicate equipment to the site and out-source well maintenance crew services (where the level of effort for well maintenance is three to six staff-months per year). Maintaining equipment and parts onsite ensures their availability and reduces cross-contamination potential. Onsite operational personnel should be trained in and perform maintenance monitoring.

(3) Out-source well service entirely: Generally, where this is feasible, it is a preferred option to avoid tying up personnel and equipment to low-frequency tasks and to take advantage of competitive bidding. Onsite operational personnel should be trained in and perform maintenance monitoring.

*c. Example costs.* The costs listed in Table 10-1 are provided to offer a range of costs for well PM planning purposes. These numbers are based on past projects and are expressed in pre-1999 dollars for the items described in Section 10-2.

**Table 10-1. Approximate Costs of PM Equipment**

Equipment	Method	Cost
(1) Chemical mixing. A tank trailer equipped as recommended	Purchase	\$3,500.00
(2) Equipment handling.		
(a) Standard 5-ton(4535-k)-hoisting capacity pump hoist equipped as described.	Purchase	\$60,000.00
	Hired (per day)	\$1,500.00
(b) Motorized, reversible pump puller unit	Purchase	\$3,000.00
(c) Equipment to handle flexible well pipe	Purchase	\$1,000.00
(3) Development and test pumping trailer (equipped).	Purchase	\$5,000.00
(4) Ancillary gear.		
(a) Generator (5 kW)	Purchase	\$3,200.00
(b) Air compressor (375-cfm (1.77 m <sup>3</sup> /sec))	Rent per week	\$200.00 to \$1,000
(c) Maintenance monitoring instruments and apparatus including voltage, amperage, resistance meter	Purchase	\$2,000.00
(d) Recommended spare parts and equipment	Purchase	\$5,000.00